

Direct Drive Unit with Autonomous Cathode Current Regulation, Phase I

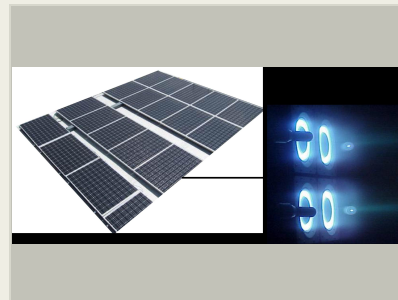
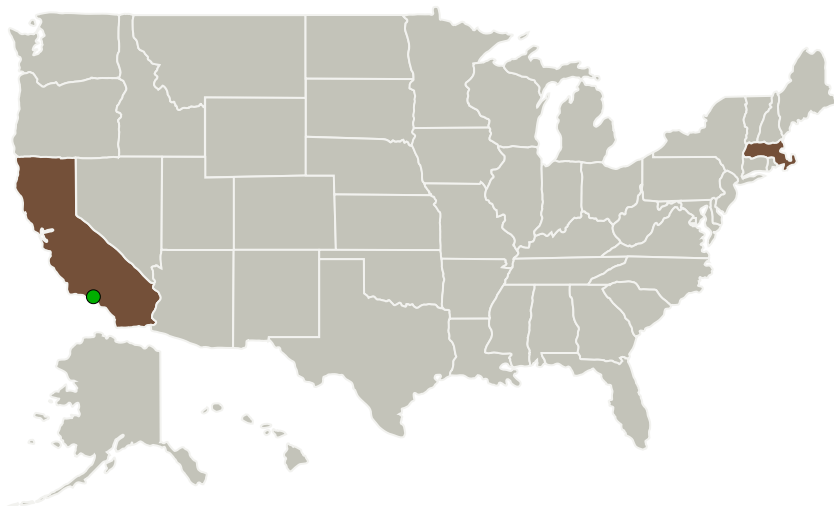
Completed Technology Project (2013 - 2013)



Project Introduction

An approach for maximizing Hall thruster electrical system efficiency is to power the thruster directly from a high voltage solar array by a method commonly referred to as direct-drive. These direct drive system designs eliminate the power processing unit (PPU) and therefore have a substantial advantage in terms of overall electrical efficiency and mass savings. This Phase I/II proposal effort is comprised of the development of a Hall thruster direct drive unit (DDU). The DDU will include a method for cathode current sharing such that multiple thrusters can be operated in parallel from a single power source. In Phase I cathode current sharing approaches will be experimentally investigated. Approaches to be evaluated include passive and active methods of cathode current control. Active approaches involves independently controlled voltage sources placed in series with each cathode while passive approaches involve controlling cathode emission using heater and keeper power. In Phase II we will develop a nominal 15kW proto-flight brassboard level DDU and deliver it to NASA for additional characterization testing. The DDU unit will include the balance of PPU per specifications provided by NASA for thruster magnets, cathode heater and keeper etc. operation.

Primary U.S. Work Locations and Key Partners



Direct Drive Unit with
Autonomous Cathode Current
Regulation

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Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Jet Propulsion Laboratory (JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

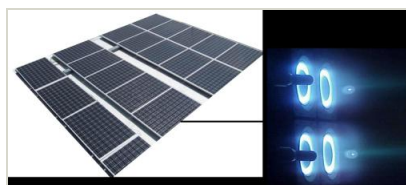
California	Massachusetts
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Project Transitions

**May 2013:** Project Start**November 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138100>)

Images

**Project Image**

Direct Drive Unit with Autonomous Cathode Current Regulation
(<https://techport.nasa.gov/image/135898>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

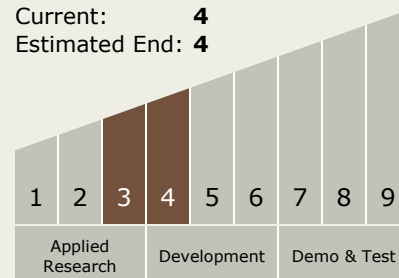
Program Manager:

Carlos Torrez

Principal Investigator:

Eric Ehrbar

Technology Maturity (TRL)

Start: **3**Current: **4**Estimated End: **4**

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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System